

From: George Devilbiss

Subject: Comments on Docket No. 01-309 RM 8658

Date: Friday, January 11, 2002 10:52 AM

In the Matter of Section 68.4(a) of the Commission's Rules Governing Hearing Aid-Compatible Telephones; WT Docket No. 01-309, RM-8658

It is generally known that the interference to hearing aids from digital cellular telephones is a complex issue.

Of great importance to the hearing aid users, the varying magnetic field generated by the varying battery current and the wiring from the battery to the telephone's electronic circuitry causes interference to the desired magnetic field generated in the T coil of the telephone which couples to the T coil of the hearing aid. Since little has been done by the telephone manufacturers to lessen this magnetic field it must be assumed that the concept of lessening this magnetic field is not understood or has not been used due to the small additional cost of using the concept. The concept will be explained and results of some experiments will be described in later paragraphs. With reference to Section II.A, paragraph which states, "Industry comments urge the Commission not to open a rulemaking citing industry progress in the absence of governmental intervention". As a party with a vital interest in HAC of wireless digital cellular telephones, I have seen little if any progress except perhaps the development of Neckloops and other attachment, which I consider expensive and cumbersome and are not "internal" as required. Attachments are an interim solution and are not acceptable as a solution. The development of ANSI Standard C63.19-2001, Standard Methods of Measurement of Compatibility between Wireless Communication Devices and Hearing Aids is very little progress in making digital cellular telephone HAC.

Section II, paragraph 7 states " no technical standards have been developed for wireless hearing aid compatibility". Standards are necessary for both the hearing aid immunity to RF detection and amplification as well as the level of magnetic field necessary for proper coupling to the telephone's audio magnetic field and the maximum level of the interfering magnetic field generated allowed without causing interference. Section III .3. Paragraph 24 requests comments on whether compliance with the HAC rule is technologically feasible for the telephones to which the exemption applies. Experiments conducted by this commenter indicate that a low cost solution exists which will be discussed in following paragraphs.

For a Hearing Aid made immune to demodulation and amplification of the FRO it is possible to lessen the magnetic field generated by the cellular telephone's battery and leads from the battery to the telephones electronics that is responsible for the interference when the hearing aid's T coil is being used.

Little information can be found on methods to lessen magnetic fields. There is much information that indicates that varying magnetic fields will induce currents in adjacent conductors and it is this phenomena that allows coupling the desired telephone's audio signal to the hearing aid's T coil.

To demonstrate a method of lessening the magnetic field from leads carrying varying current, if a magnetometer is held near a lamp cord in which AC current is flowing, a small magnetic field will be indicated. If however the cord has its two conductors separated a fraction of an inch, the magnetic field will be greatly increased at this point. This effect is due to the fact that in closely spaced conductors where the current is flowing in equal amounts but in opposite

direction, the magnetic fields are lessened but with separation this lessening effect is not as great.

Since the digital cellular telephone's battery is made up of a number of separate cells no self canceling of the magnetic fields occurs and as a result a magnetometer held near a digital cellular telephone's battery indicates that a strong magnetic field is generated.

To demonstrate that this magnetic field can be greatly lessened or even eliminated a pulsing current generator was designed that simulates the pulsing current in the telephone. Four AA cells were connected in series in a 2x2 configuration in the manner of the cells in the telephone battery and connected to the simulator. The field measured in the vicinity of this battery was very strong, 200 Ma/meter or more. The amount of field strength required for proper operation of an audio loop is only 50-100 Ma/meter. This indicates that the telephone's battery is a source of the interference. When the same simulator was connected to a telephone's battery a similar reading was obtained.

Next, the four AA cells in series were placed in copper tubing and so connected that the current flowing in the battery and in the copper tubing were in opposite directions and little magnetic field could be measured so encasing the cells making up the telephone battery in some type of conducting foil connected so that the current flowing in the foil is in the opposite direction as that in the cells will greatly decrease this source of interference.

To demonstrate the effect of widely separated current leads the battery was connected to the simulator by a pair of leads separated only by the thickness of the insulation and the measured field was in the order of 10-25Ma/meter. When the leads were separated by an inch the magnetic field increased to over 100 Ma/meter.

To test the effectiveness of shielded wire with a shield that completely surrounded the inner conductor (RG-174U coaxial cable) was used to connect the battery to the simulator, and even though the wire was configured into a multi-turn coil to increase the magnetic field little magnetic field was measured.

Section III.D, paragraph 31. Since it is possible to make all digital cellular telephones HAC phone a "product line" for hearing impaired individuals is neither required nor desirable This also makes "pairing" of hearing aids and cellular telephones unnecessary as suggested by the CTIA, Section III.A.13.

Section III.E, paragraph 32. A phased-in approach would seem to be best with perhaps a year allowed for implementation but with quarterly progress reports to the FCC so that a decision could be made if more time is required for implementation.

Section III.E, paragraph 33. All parties that can contribute to a timely solution should be brought together to solve this issue. Some agreement should be made as to who will be responsible for the preparation of standards for hearing aid immunity, and magnetic field specifications that allow use of hearing aid's T coil without interference. A standard for the sensitivity of the T coil to the desired coupling of the desired Audio signal from the telephone is also required.

There is no reason the telephone industry should not work on the elimination of the undesired magnetic fields generated by the pulsing battery current and make quarterly reports to the FCC of their progress.

The commenter has prepared a board that can be brought to the FCC to demonstrate the above mentioned experiments to eliminate the magnetic fields if desired.

Sincerely,

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